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ABSTRACT

10 An apparatus measures a property of a layer (such as the sheet resistance of a conductive layer or thermal conductivity of a dielectric layer that is located underneath the conductive layer) by performing the following method: (1) focusing the heating beam on the heated a region (also called "heated region") of the conductive layer (2) modulating the power of the heating beam at a predetermined frequency that is  
15 selected to be sufficiently low to ensure that at least a majority (preferably all) of the generated heat transfers out of the heated region by diffusion, and (3) measuring the power of another beam that is (a) reflected by the heated region, and (b) modulated in  
20 phase with modulation of the heating beam. The measurement in act (3) can be used directly as a measure of the resistance (per unit length) of a conductive line formed by patterning the conductive layer. Acts (1)-(3) can be repeated during fabrication  
25 of a semiconductor wafer, at each of a number of regions on a conductive line, and any change in measurement indicates a corresponding change in resistance of the line. When the measurement changes by more than a predetermined amount (e.g. by 10%), a  
30 process parameter that controls the fabrication process is changed to return the measurement to normal in the next wafer. Moreover, the thermal conductivity of the dielectric layer can be measured, or monitored for changes beyond a predetermined limit during a scan  
35 across the wafer, if resistance is known.